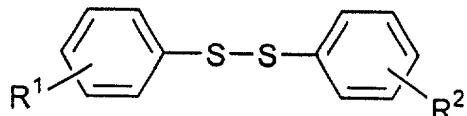


WHAT IS CLAIMED IS:

1. A non-aqueous secondary battery which comprises
a positive electrode, a negative electrode, a separator,
5 and an electrolytic solution which contains a substituted
diphenyldisulfide derivative having the formula:

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wherein each of R¹ and R² independently represents an
alkoxy group having 1 to 6 carbon atoms, an alkenyloxy
group having 2 to 6 carbon atoms, an alkynyloxy group
having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6
carbon atoms, an aryloxy group having 6 to 12 carbon
atoms, an acyloxy group having 2 to 7 carbon atoms, an
alkanesulfonyloxy group having 1 to 7 carbon atoms, an
arylsulfonyloxy group having 6 to 10 carbon atoms, an
alkoxycarbonyloxy group having 2 to 7 carbon atoms, an
aryloxycarbonyloxy group having 7 to 13 carbon atoms, a
halogen atom, CF₃, CCl₃, or CBr₃,
in an amount of 0.01 to 5 weight % based on the amount of
the electrolytic solution.

30

2. The non-aqueous secondary battery of claim 1,
in which each of R¹ and R² is an alkoxy group having 1 to
6 carbon atoms.

35

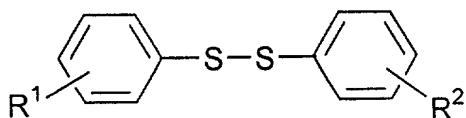
3. The non-aqueous secondary battery of claim 1,
wherein the substituted diphenyldisulfide derivative is
contained in the non-aqueous electrolytic solution in an
amount of 0.01 to 2 weight % based on the amount of the
electrolytic solution.

4. The non-aqueous secondary battery of claim 1,
wherein the positive electrode comprises lithium complex
oxide.

5 5. The non-aqueous secondary battery of claim 1,
wherein the negative electrode comprises natural graphite
or artificial graphite.

10 6. The non-aqueous secondary battery of claim 5,
wherein the natural or artificial graphite has a lattice
plane of (002) having a plane distance in term of d_{002} in
a length of 0.335 to 0.340 nm.

15 7. A non-aqueous electrolytic solution containing
a substituted diphenyldisulfide derivative having the
following formula:



20

wherein each of R¹ and R² independently represents an
alkoxy group having 1 to 6 carbon atoms, an alkenyloxy
group having 2 to 6 carbon atoms, an alkynyloxy group
having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6
carbon atoms, an aryloxy group, an acyloxy group having 2
to 7 carbon atoms, an alkanesulfonyloxy group having 1 to
7 carbon atoms, an arylsulfonyloxy group having 6 to 10
carbon atoms, an alkoxy carbonyloxy group having 2 to 7
25 carbon atoms, an aryloxycarbonyloxy group, a halogen
atom, CF₃, CCl₃, or CBr₃, in an amount of 0.01 to 5 weight
30 % based on the amount of the electrolytic solution.

35 8. The non-aqueous electrolytic solution of claim
7, in which each of R¹ and R² is an alkoxy group having 1
to 6 carbon atoms.

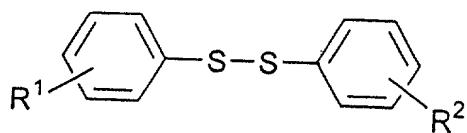
9. The non-aqueous electrolytic solution of claim 7 in which the substituted diphenyldisulfide derivative is bis(4-methoxyphenyl)disulfide.

5 10. The non-aqueous electrolytic solution of claim 7, wherein the substituted diphenyldisulfide derivative is contained in the non-aqueous electrolytic solution in an amount of 0.01 to 2 weight % based on the amount of the electrolytic solution.

10 11. The non-aqueous electrolytic solution of claim 7, which contains LiPF₆, LiBF₄, LiClO₄, LiN(SO₂CF₃)₂, LiN(SO₂C₂F₅)₂, LiC(SO₂CF₃)₃, LiPF₄(CF₃)₂, LiPF₃(CF₃)₃, LiPF₃(C₂F₅)₃, LiPF₅(iso-C₃F₇), or LiPF₄(iso-C₃F₇)₂.

15 12. The non-aqueous electrolytic solution of claim 7, which contains a solvent selected from the group consisting of ethylene carbonate, propylene carbonate, butylene carbonate, vinylene carbonate, dimethyl carbonate, methyl ethyl carbonate, methyl isopropyl carbonate, methyl isobutyl carbonate, diethyl carbonate, diisopropyl carbonate, diisobutyl carbonatetetrahydrofuran, 2-methyltetrahydrofuran, 1,4-dioxane, 1,2-dimethoxyethane, 1,2-diethoxyethane, 1,2-dibutoxyethane, γ -butyrolactone, acetonitrile, methyl propionate, and dimethylformamide.

20 25 30 35 13. A non-aqueous secondary battery which comprises a positive electrode, a negative electrode, a separator, and an electrolytic solution which contains a substituted diphenyldisulfide derivative having the formula:



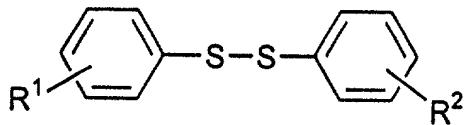
wherein each of R¹ and R² independently represents an alkoxy group having 1 to 6 carbon atoms, an alkenyloxy group having 2 to 6 carbon atoms, an alkynyloxy group having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6
5 carbon atoms, an aryloxy group having 6 to 12 carbon atoms, an aralkyloxy group having 7 to 15 carbon atoms, an acyloxy group having 2 to 7 carbon atoms, an alkane-sulfonyloxy group having 1 to 7 carbon atoms, an arylsul-
10 fonyloxy group having 6 to 10 carbon atoms, an alkoxy-carbonyloxy group having 2 to 7 carbon atoms, a halogen atom, CF₃, CCl₃, or CBr₃,
in an amount of 0.001 to 5 weight % based on the amount
of the electrolytic solution, and an additive compound
selected from the group consisting of methyl 2-propyl-
15 carbonate, 2-propynyl methanesulfonate, 1,3-propanesul-
tone, divinylsulfone, and 1,4-butanediol dimethanesul-
fonate, in an amount of 0.01 to 10 weight % based on the
amount of the electrolytic solution.

20 14. The non-aqueous secondary battery of claim 13,
in which each of R¹ and R² is an alkoxy group having 1 to
6 carbon atoms.

25 15. The non-aqueous secondary battery of claim 13,
wherein the negative electrode comprises natural graphite
or artificial graphite.

30 16. The non-aqueous secondary battery of claim 15,
wherein the natural or artificial graphite has a lattice
plane of (002) having a plane distance in term of d₀₀₂ in
a length of 0.335 to 0.340 nm.

35 17. A non-aqueous electrolytic solution containing
a substituted diphenyldisulfide derivative having the
following formula:



5

wherein each of R¹ and R² independently represents an alkoxy group having 1 to 6 carbon atoms, an alkenyloxy group having 2 to 6 carbon atoms, an alkynyloxy group having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6 carbon atoms, an aryloxy group having 6 to 12 carbon atoms, an aralkyloxy group having 7 to 15 carbon atoms, an acyloxy group having 2 to 7 carbon atoms, an alkane-sulfonyloxy group having 1 to 7 carbon atoms, an arylsulfonyloxy group having 6 to 10 carbon atoms, an alkoxy-carbonyloxy group having 2 to 7 carbon atoms, a halogen atom, CF₃, CCl₃, or CBr₃, in an amount of 0.001 to 5 weight % based on the amount of the electrolytic solution, and an additive compound selected from the group consisting of methyl 2-propyl-carbonate, 2-propynyl methanesulfonate, 1,3-propanesulfone, divinylsulfone, and 1,4-butanediol dimethanesulfonate, in an amount of 0.01 to 10 weight % based on the amount of the electrolytic solution.

25

18. The non-aqueous electrolytic solution of claim 17, in which each of R¹ and R² is an alkoxy group having 1 to 6 carbon atoms.

30

19. The non-aqueous electrolytic solution of claim 17 in which the substituted diphenyldisulfide derivative is bis(4-methoxyphenyl)disulfide.

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20. The non-aqueous electrolytic solution of claim 17, wherein the substituted diphenyldisulfide derivative is contained in the non-aqueous electrolytic solution in an amount of 0.01 to 0.7 weight % based on the amount of

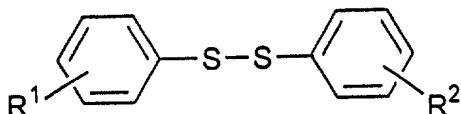
the electrolytic solution.

21. The non-aqueous electrolytic solution of claim 17, wherein the additive is contained in the non-aqueous 5 electrolytic solution in an amount of 0.05 to 5 weight % based on the amount of the electrolytic solution.

22. The non-aqueous electrolytic solution of claim 17, which contains LiPF₆, LiBF₄, LiClO₄, LiN(SO₂CF₃)₂, 10 LiN(SO₂C₂F₅)₂, LiC(SO₂CF₃)₃, LiPF₄(CF₃)₂, LiPF₃(CF₃)₃, LiPF₃(C₂F₅)₃, LiPF₅(iso-C₃F₇), or LiPF₄(iso-C₃F₇)₂.

23. The non-aqueous electrolytic solution of claim 17, which contains a solvent selected from the group consisting of ethylene carbonate, propylene carbonate, 15 butylene carbonate, vinylene carbonate, dimethyl carbonate, methyl ethyl carbonate, methyl isopropyl carbonate, methyl isobutyl carbonate, diethyl carbonate, diisopropyl carbonate, diisobutyl carbonatetetrahydrofuran, 2-methyltetrahydrofuran, 1,4-dioxane, 1,2-dimethoxyethane, 1,2-diethoxyethane, 1,2-dibutoxyethane, γ-butyrolactone, acetonitrile, methyl propionate, and dimethylformamide. 20

24. A non-aqueous secondary battery which comprises 25 a positive electrode, a negative electrode, a separator, and an electrolytic solution which contains a substituted diphenyldisulfide derivative having the formula:



wherein each of R¹ and R² independently represents an alkoxy group having 1 to 6 carbon atoms, an alkenyloxy 35 group having 2 to 6 carbon atoms, an alkynyloxy group having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6

carbon atoms, an aryloxy group having 6 to 12 carbon atoms, an aralkyloxy group having 7 to 15 carbon atoms, an acyloxy group having 2 to 7 carbon atoms, an alkane-sulfonyloxy group having 1 to 7 carbon atoms, an arylsulfonyloxy group having 6 to 10 carbon atoms, an alkoxy-carbonyloxy group having 2 to 7 carbon atoms, a halogen atom, CF_3 , CCl_3 , or CBr_3 ,

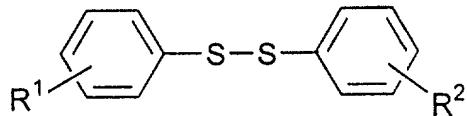
5 in an amount of 0.001 to 5 weight % based on the amount
of the electrolytic solution, and cyclohexylbenzene in an
10 amount of 0.1 to 5 weight % based on the amount of the
electrolytic solution.

25. The non-aqueous secondary battery of claim 24,
in which each of R^1 and R^2 is an alkoxy group having 1 to
15 24 carbon atoms.

26. The non-aqueous secondary battery of claim 24,
wherein the negative electrode comprises natural graphite
or artificial graphite.

20 27. The non-aqueous secondary battery of claim 26,
wherein the natural or artificial graphite has a lattice
plane of (002) having a plane distance in term of d_{002} in
a length of 0.335 to 0.340 nm.

25 28. A non-aqueous electrolytic solution containing
a substituted diphenyldisulfide derivative having the
following formula:



35 wherein each of R^1 and R^2 independently represents an
alkoxy group having 1 to 6 carbon atoms, an alkenyloxy
group having 2 to 6 carbon atoms, an alkynyloxy group

having 2 to 6 carbon atoms, a cycloalkyloxy having 3 to 6 carbon atoms, an aryloxy group having 6 to 12 carbon atoms, an aralkyloxy group having 7 to 15 carbon atoms, an acyloxy group having 2 to 7 carbon atoms, an alkane-
5 sulfonyloxy group having 1 to 7 carbon atoms, an arylsulfonyloxy group having 6 to 10 carbon atoms, an alkoxy-carbonyloxy group having 2 to 7 carbon atoms, a halogen atom, CF_3 , CCl_3 , or CBr_3 ,
in an amount of 0.001 to 5 weight % based on the amount
10 of the electrolytic solution, and cyclohexylbenzene in an amount of 0.1 to 5 weight % based on the amount of the electrolytic solution.

15 29. The non-aqueous electrolytic solution of claim
28, in which each of R^1 and R^2 is an alkoxy group having 1 to 6 carbon atoms.

20 30. The non-aqueous electrolytic solution of claim 28 in which the substituted diphenyldisulfide derivative is bis(4-methoxyphenyl)disulfide.

25 31. The non-aqueous electrolytic solution of claim 28, wherein the substituted diphenyldisulfide derivative is contained in the non-aqueous electrolytic solution in an amount of 0.01 to 0.7 weight % based on the amount of the electrolytic solution.

30 32. The non-aqueous electrolytic solution of claim 28, wherein the cyclohexylbenzene is contained in the non-aqueous electrolytic solution in an amount of 0.5 to 3 weight % based on the amount of the electrolytic solution.

35 33. The non-aqueous electrolytic solution of claim 28, which contains LiPF_6 , LiBF_4 , LiClO_4 , $\text{LiN}(\text{SO}_2\text{CF}_3)_2$, $\text{LiN}(\text{SO}_2\text{C}_2\text{F}_5)_2$, $\text{LiC}(\text{SO}_2\text{CF}_3)_3$, $\text{LiPF}_4(\text{CF}_3)_2$, $\text{LiPF}_3(\text{CF}_3)_3$,

LiPF3(C2F5)3, LiPF5(iso-C3F7), or LiPF4(iso-C3F7)2.

34. The non-aqueous electrolytic solution of claim
28, which contains a solvent selected from the group con-
5 sisting of ethylene carbonate, propylene carbonate,
butylene carbonate, vinylene carbonate, dimethyl carbon-
ate, methyl ethyl carbonate, methyl isopropyl carbonate,
methyl isobutyl carbonate, diethyl carbonate, diisopropyl
carbonate, diisobutyl carbonatetetrahydrofuran, 2-methyl-
10 tetrahydrofuran, 1,4-dioxane, 1,2-dimethoxyethane, 1,2-
diethoxyethane, 1,2-dibutoxyethane, γ -butyrolactone, ace-
tonitrile, methyl propionate, and dimethylformamide.

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